Montana Dam Safety Outlet

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EMERGENCY ACTION PLAN VERIFICATION FOR DAMS

The Department of Natural Resources and Conservation (DNRC) Dam Safety Program is responsible for regulating over 90 high-hazard dams. To be classified as high-hazard, a probability of loss of life in the event of a dam failure must exist. The owner of each high-hazard dam is responsible for developing an emergency action plan to be used as a response guideline if the dam fails or sustains damage.

Eureka Wastewater Impoundment Dam (Lincoln County)

Tom Sanburg was recently hired by DNRC to review, evaluate and verify that emergency action plans are up-to-date and effective. To accomplish this, the plans are put through the following three–phase review process:

Phase 1. Plan Review
Phase 2. Plan Modification
Phase 3. Plan Testing

Phase 1. Plan Review. The plan is read from start to finish to ensure that a layman can understand and use it. These plans are used by a variety of people including County Sheriffs, Disaster and Emergency Services (DES) personnel, local engineers, and dam operators, as well as state dam safety personnel. Chapter 14, Sub-Chapter 4 of the *Administrative Rules of Montana* is used as a guideline to make sure that all required elements are included in each plan. Notification flow charts are reviewed to make sure that the correct agencies are included in the notification chain, and evacuation maps are reviewed to ensure that they are current, clean, and easy to use.

Phase 2. Plan Modification. All comments from the plan review process are sent to the dam owner to be integrated into the plan. The dam owner will usually coordinate the plan changes with the local DES coordinator and county sheriff so that all three are in agreement before changes are made. The dam owner is responsible for reviewing the plan annually and sending change pages to all parties that keep copies of the plan.

Phase 3. Plan Testing. Exercise scenarios are developed to evaluate the effectiveness of the plan and the ability of agencies to use it. The most commonly used form of an exercise is a *tabletop*. Other forms of exercises include *drills, functional exercises* and *full-scale exercises*. In a *tabletop exercise*, pertinent agencies are represented in an informal, conference room setting. A situation narrative is presented with maps and charts, etc. The participants are evaluated on steps that they take in response to inputs from exercise simulators. Individuals are encouraged to discuss decisions in depth, and the emphasis is

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RODENTS CAUSE DAM BREAK

Animal burrows were the prime suspects in the failure by piping of a 70-year-old earthfill dam in Ohio. There were no reported injuries, but damage to farmland was estimated between $1 million and $2 million.

The failure tore out an 83-foot-wide section of the dam about 15 feet above its base. Cascading water from the 6,500-acre-foot-capacity reservoir flooded acres of farmland. More serious damage from the failure was averted because floodwaters were contained in a smaller reservoir 5 miles downstream. This dam had been inspected, and the owner was ordered to initiate a rodent control program and to backfill numerous burrows in the structure already caused by rodents.

Dam Safety Tip: The recommended method of backfilling an animal burrow on an embankment is mud-packing. This simple, inexpensive method can be accomplished by placing one or two lengths of metal stove or vent pipe in a vertical position over the entrance of the den, making sure that the pipe connection to the den does not leak. A mudpack mixture is then poured into the pipe until the burrow and pipe are filled. After the mudpack has set up and the pipe is removed, the former entrance is plugged with well-compacted earth, and vegetation reestablished. The mudpack is made by adding water to a 90-percent earth and 10-percent cement mixture until a slurry or thin cement consistency is attained. Dens should be eliminated without delay, because damage from just one hole can lead to failure of a dam or levee.

Adapted with permission from Ohio Dam Safety.

ANNOUNCEMENTS!

This year's annual *Dam Safety Seminar* will focus on outlets, gates, and siphons. It will be scheduled sometime in April or May. The location will likely be in Billings, and the presentations will last about a day and a half. Look for more information on this program in the near future.

DNRC will also be sponsoring a course on *Advanced Slope Stability Analysis*. URS, Inc. developed this course in cooperation with the Association of State Dam Safety Officials. It will consist of two days of lectures and one day hands-on computer analysis using the Slope/W software. We are tentatively looking at March 2001 in Helena. More details to come!

The DNRC Dam Safety Section will be hiring *Engineering Project Aides* for the summer of 2001. Applications will be required sometime in January, and interviews will be conducted in February 2001. These aides will work out of Helena, Billings, Havre, Lewistown, and Missoula. We will be recruiting engineering students as well as people with dam experience for these positions. If you know of anyone that would be interested, please have him or her call Terry Voeller at 444-6664.

Have you been working on a "dam" project worth talking about? How about presenting a paper at next year's *Association of State Dam Safety Officials Annual Conference?* It will be held at Snowbird, Utah, in September 2001. Abstract are due March 1, 2001. For more information refer to **www.damsafety.org.**

Several high-hazard dams were recommended for *Renewable Resource Grant and Loan Program* funding: Bair Dam (Meagher County); Nevada Creek Dam (Powell County); State Prison Ranch Dams (Powell County); Wyant Lake Dam (Ravalli County); Canyon Lake Dam (Ravalli County);Lower Willow Creek Dam (Granite County); and the Basin Creek Dams (Butte Silverbow County). The next step is 2001 legislative Long Range Building Committee hearings on all grant applications. The ranking can be rearranged by the committe. Because there are more grant applications than available money, it is important for the project sponsors and applicants to testify and lobby support. For more information refer to the DNRC Grants and Loans program at **www.dnrc.state.mt.us/cardd/loangrnt.htm.**

FREE DAM SEEPAGE MONITORING SOFTWARE AVAILABLE SOON FREE

It is common practice to use devices to monitor seepage flow through dams. Often, a problem developing in the dam will be obvious in the seepage measurements long before it can be detected by a visual inspection. However, long-term data are critical in order to identify abnormalities in measurements. In order to facilitate the collection of these data by dam owners, the Federal Emergency Management Agency (FEMA) sponsored the development of a user-friendly seepage monitoring database.

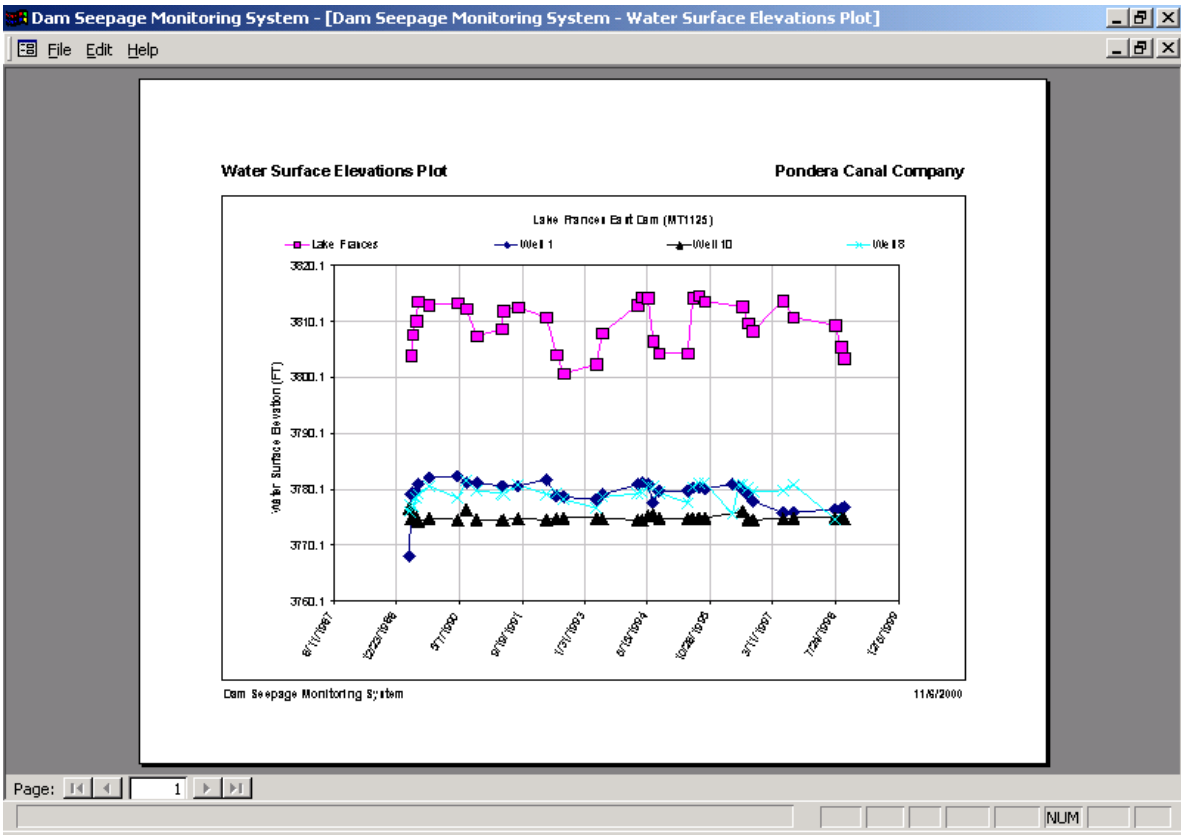
The seepage monitoring database was primarily designed to be used by dam owners, but may also be of use to others who collect or analyze seepage data, such as the owner's engineer or state dam safety personnel. The database is designed to run on Windows 95, 98, 2000, and NT platforms and can handle up to 10 reservoirs and dams, as well as a wide variety of instruments. The user can also put in direct flow measurements for "unconventional" measuring devices. The program also can create reports and a variety of hydrographs (see Figure 1). This will allow the dam owner to see instantly whether a measurement is either in error or reflective of a problem.

The program also easily imports and exports data. This feature allows the incorporation of data that are already maintained in a spreadsheet format. The export option allows the engineer to do a more detailed evaluation of the data, if necessary.

This program was not intended to replace commercially available dam monitoring databases, and as such has a few limitations. For example, the program can only handle up to 10 reservoirs and dams. In addition, the program does not handle sophisticated electronic instrumentation. However, for the majority of the dam owners, these limitations will not be an issue.

FEMA will begin shipping software installation CDs to state dam safety programs in late January. If you are interested in using this software to monitor seepage in your dam, please contact Michele Lemieux, with the Montana Dam Safety Program, at (406) 444-6613.

Figure 1. Example plot from seepage monitoring software



DAM CONSTRUCTION NEWS - REHABILLITATION OF METAL OUTLET PIPES ON HIGH-HAZARD DAMS

Doggett Dam, located in Meagher County, just west of White Sulphur Springs, recently underwent outlet pipe rehabilitation. The existing pipe was slipped lined with a high-density polyethylene liner pipe. The project also included the installation of a new gate, trashrack, and downstream filter. Next year, the addition of a stability berm and toe drain will be considered. The dam is owned by the Camas Creek Cattle and Sheep Company. The engineer on the project is Lewis Burton and Associates of Belgrade, Montana.

Installing diaphram filter around slip-lined pipe on Dogget Dam

Abandoned outlet conduit removed from Tin Cup Dam (Powell County)

Tin Cup Lake Dam, located on the State Prison Ranch in Powell County, is currently being rebuilt after an abandoned outlet pipe was removed from the dam. The abandoned pipe went undetected for several years, due to thick vegetation on the downstream side of the dam. Everyone was shocked upon seeing the condition of the old pipe, once it was removed! The rehabilitation also includes considerable embankment work such as the addition of stability berms, chimney drains, and toe drains. The engineer on the project is Portage Engineering, of Helena Montana.

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on slow-paced problem solving rather than rapid, spontaneous decision-making.

A *drill* tests the function of one element of the response system. An example of a drill is a test of an early warning notification system.

A *functional exercise* is used to test the coordination of the emergency management system under conditions of realism and stress. The functional exercise gives participants a fully simulated experience of being in a major disaster. A functional exercise requires activation of a real or simulated emergency operations center. This may be done using actual communications systems or using a portable telephone system that can be set up in a large building.

In a *full-scale exercise*, agencies actually deploy response teams and simulate evacuations and/or treatment of casualties depending on the scenario. A full-scale exercise is very expensive and requires much interagency coordination.

The DNRC Dam Safety Program plans to review at least 20 emergency action plans per year. Several exercises will be conducted each year on an adhoc basis. The exercises will be conducted in a crawl, walk, run progression, starting with orientation seminars and tabletops in preparation for functional and full-scale exercises.

Questions about emergency action plans for dams can be directed to Tom Sanburg at (406) 444-9362.

FEASIBILITY STUDIES COMPLETED FOR BAIR AND NEVADA CREEK DAMS

On the docket for the next biennium are plans for the rehabilitation of two more of DNRC's high hazard dams. Feasibility studies have been completed for Bair Dam east of White Sulphur Springs and Nevada Creek Dam south of Helmville. HKM Engineering completed these two studies under contract to the State Water Projects Bureau. True to form, these two studies included: consultation and meetings with the two water users associations, surveying and mapping, geotechnical drilling, data collection and analyses, hydrologic and flood studies, economic analyses, cultural resources studies, alternatives identification and costing, and selection of a preferred plan for rehabilitation of each of the dams. The two studies were finalized in September 2000.

The State Water Conservation Board constructed both these dams during the dirty thirties. Both dams' spillways are to the point where bandaid repairs are no longer appropriate. As well, both spillways have inadequate capacities according to current dam safety regulations and criteria. The preferred rehabilitation plans include totally new spillways at both dams. In addition, a steep slope above the spillway at Bair Dam will be excavated to a gentler slope to alleviate talus creep into the spillway. At Nevada Creek Dam additional work will be done to control seepage at the toe of the dam. Both dams will receive toe berms and have some work done at the outlet strucures.

Estimated costs for the projects are nearly $2 million at Bair and nearly $3 million at Nevada Creek. The projects will be funded through combinations of funding from the Hydropower Earnings Account, Water Storage Account, grants, and loans. If approval is secured from the next legislative session, final design would be initiated in July 2001 and construction would be completed by the fall of 2002.

PROGRESS ON GPS SYSTEMS

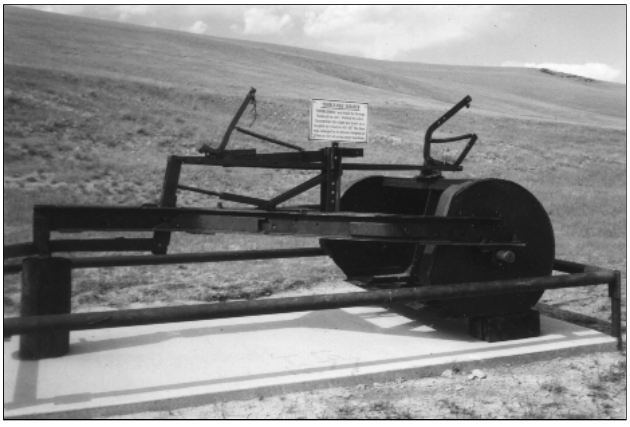
The Montana Natural Resource Information System (NRIS) has developed a web site, called "Topo Finder." This site allows you to enter latitude and longitude data from your global positioning system (GPS) tool onto a quadrangle map and retrieve section, township, and range from the quad map. It allows you to bring up on the screen any quad map in which you are interested. This is a new system that will have a variety of uses for state government and engineers who are on the Internet. The system is not developed specifically to convert latitude and longitude to section, township, and range. The web site is: **http://nris.state.mt.us/topofinder.html.**

♦ Quotes for the lighter side ♦

WAGES

Today's payslip has more deductions than a Sherlock Holmes novel.
---Raymond Cvikota

HISTORICAL DAM-BUILDING EQUIPMENT



TumbleBug Scraper

"TumbleBug" was built by George Voldseth in 1937 to help build his irrigation dam located in Meagher County. It was pulled by a D-6 Caterpillar. Mr. Voldseth's dam was built to a height of 18 feet in 1937-1938. (It was later enlarged to 32 feet using larger machines.)

RESEARCH ON USE OF PLASTIC PIPES IN DAMS

The Association of State Dam Safety Officials(ASDSO) and the Montana Dam Safety Program are researching the use of plastic pipes for dam outlets. The use of high density polyethylene (HDPE) as a replacement material for deteriorating corrugated metal pipes is becoming more common. There are several advantages to using HDPE: ease of installation, ease of material transportation, low frictional resistance to flow and relatively low cost. However, there are several disadvantages that must to be considered: HDPE can experience significant temperature related expansion and contraction. It is also difficult to determine the proper bedding or cradle. Since HDPE is considered to be flexible, using a rigid cradle (concrete or flowable backfill) may not be compatible.

The long-term performance of HDPE has not been verified, therefore most other states do not allow plastic pipe for outlets in high hazard dams. The exception is when HDPE is used for slip lining existing pipes. However, even with slip lining there are some concerns: generally, it is difficult to properly seal the annular space between the existing pipe and the liner pipe. There is also some evidence that slip lining a pipe with holes can cause seepage to redirect along the outside of the pipe. The one consensus reached to date is that a properly designed downstream sand/gravel filter is necessary for any slip lined project.

A search of literature has shown that there is a shortage of design information that deals specifically with plastic pipes for dam applications. Most of the information available is from pipe vendors and applies to the use of plastic pipe in sewers.

ASDSO will be sending out a nationwide "electronic" survey in the next few weeks, in hopes to collect information on the use of HDPE and other plastic pipes for dam applications. Anyone with familiarity with plastic pipe is encouraged to reply, including dam owners, engineers, state and federal regulators. The results of this survey will be tabulated and distributed back to respondents. If you have any questions, please contact Michele Lemieux (444-6613).

Persons with disabilities who need an alternative, acessible format of this document should contact: DNRC, 48 North Last Chance Gulch, P.O. Box 201601, Helena, MT 59620, Phone: (406) 444-6601/Fax: (406) 444-0533/TDD: (406) 444-6873
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